DRAFT Memorandum

To: Sean Sheldrake, United States Environmental Protection Agency Region 10

From: CDM Smith

Date: April 19, 2019

Subject: Subsurface Modeling Evaluation and Sediment Management Area Delineation

Introduction

Sediment management areas (SMAs) depicted in the Portland Harbor Superfund Site (Site) Record of Decision (ROD) were developed using chemical data only from the surface sediment (top 0-30 centimeters [cm]) due to the limited number of subsurface sediment cores collected during the Remedial Investigation (RI) and Feasibility Study (FS) (EPA 2016, 2017). While the existing subsurface core data is limited in significant areas of the Site for completing remedial design, additional sediment data in both the surface and subsurface have been collected since the RI/FS database was finalized. These data, in addition to the RI/FS cores, have been incorporated into a Site-wide subsurface sediment model. This new model will be used to support many components of remedial design decisions including:

- Identify areas where higher density subsurface sediment core sampling is needed to horizontally and vertically bound areas of contamination
- Estimate volumes of contaminated sediments in SMA areas to generate more accurate disposal costs
- Explore how SMA areas change over time with new bathymetry surveys and additional sediment samples

This model will be continually updated as new subsurface data are collected throughout the Site.

Subsurface Sediment Model Development

The subsurface sediment model has been developed using a three-dimensional (3-D) geological modeling software program called Leapfrog Works (v2.2.2) developed by Seequent. Leapfrog Works uses sample locations, chemistry data, and mathematical interpolations to develop 3-D estimates of areas of interest.

For Portland Harbor, sediment samples from the RI/FS database, River Mile (RM) 11E Supplemental RI/FS (GSI 2014), and 2018 Pre-Design Investigation (PDI) have currently been incorporated into the 3-D model. As new remedial design samples are collected the model will be updated to include this new information.

Sediment sample locations throughout the Site were draped over the 2018 bathymetric surface (i.e., river bottom elevations) to accurately place them in 3-D space. From there, concentrations of the ROD Table 21 contaminants of concern (COCs) were evaluated to determine if they were greater than the applicable remedial action level (RAL) and/or principal threat waste (PTW) threshold. A 3-D field of interpolated sediment concentrations for the Table 21 COCs was developed and the union of the individual COC exceedances of RALs and/or PTW thresholds were mapped as subsurface SMAs. **Figure 1** shows the lateral extent (i.e., two dimensions) of the modeled subsurface SMAs compared to the ROD SMAs (surface sediment only).

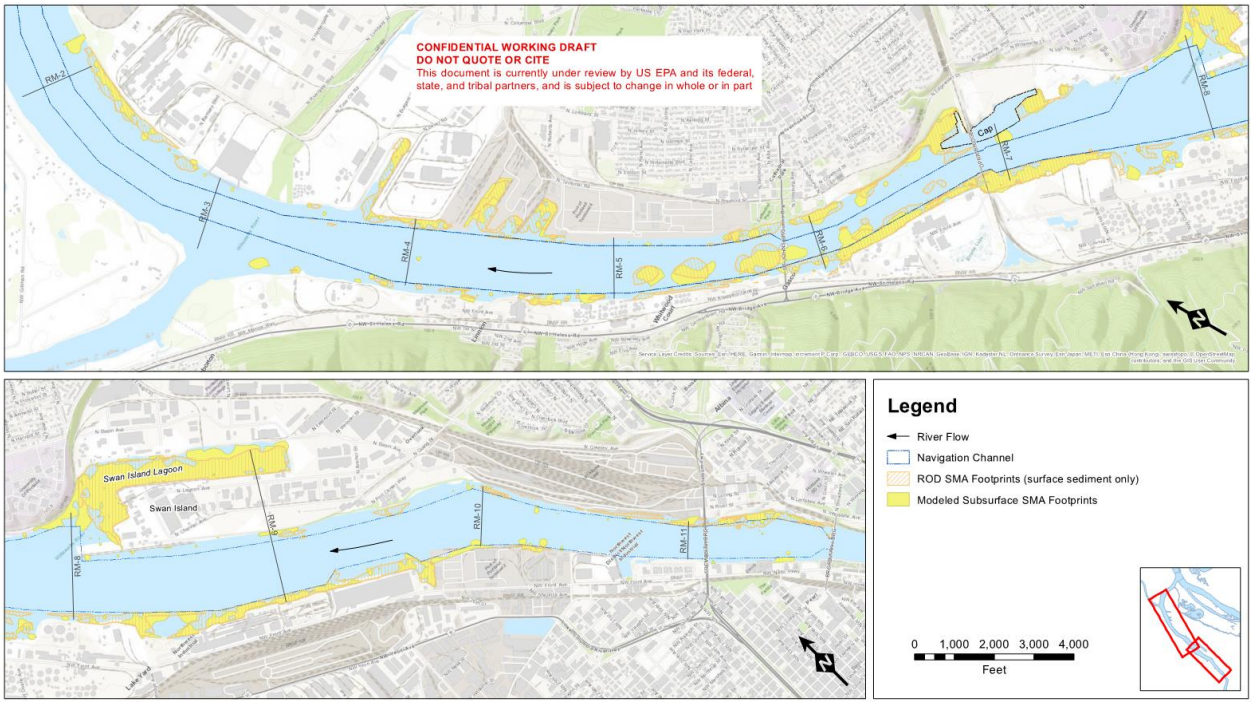

Figure 1. Site-wide map of the modeled subsurface SMA footprints compared to the ROD SMA footprints (surface sediment only).

Figure 1 shows that the majority of the modeled subsurface SMA footprints are encompassed by the ROD surface-only SMA footprints. However, there are some areas where subsurface contamination is estimated to be present where the surface (top 0-30cm) may not contain RAL or PTW exceedances. This is consistent with the conceptual site model (CSM) in the ROD where clean sediment may be depositing in areas of subsurface contamination. These estimated areas of subsurface contamination should be further evaluated in remedial design. **Supplemental Figure S1** shows the modeled subsurface SMA areas on a smaller spatial scale.

Current Applications

The 3-D sediment model has already been used to identify subsurface sediment RAL exceedances outside of the Pre-RD Group's preliminary refined PDI surface-only SMA footprint area. This analysis was conducted throughout the Site, and **Figure 2** shows how the modeled subsurface SMAs were compared against the Pre-RD Group's surface-only SMAs in an area.

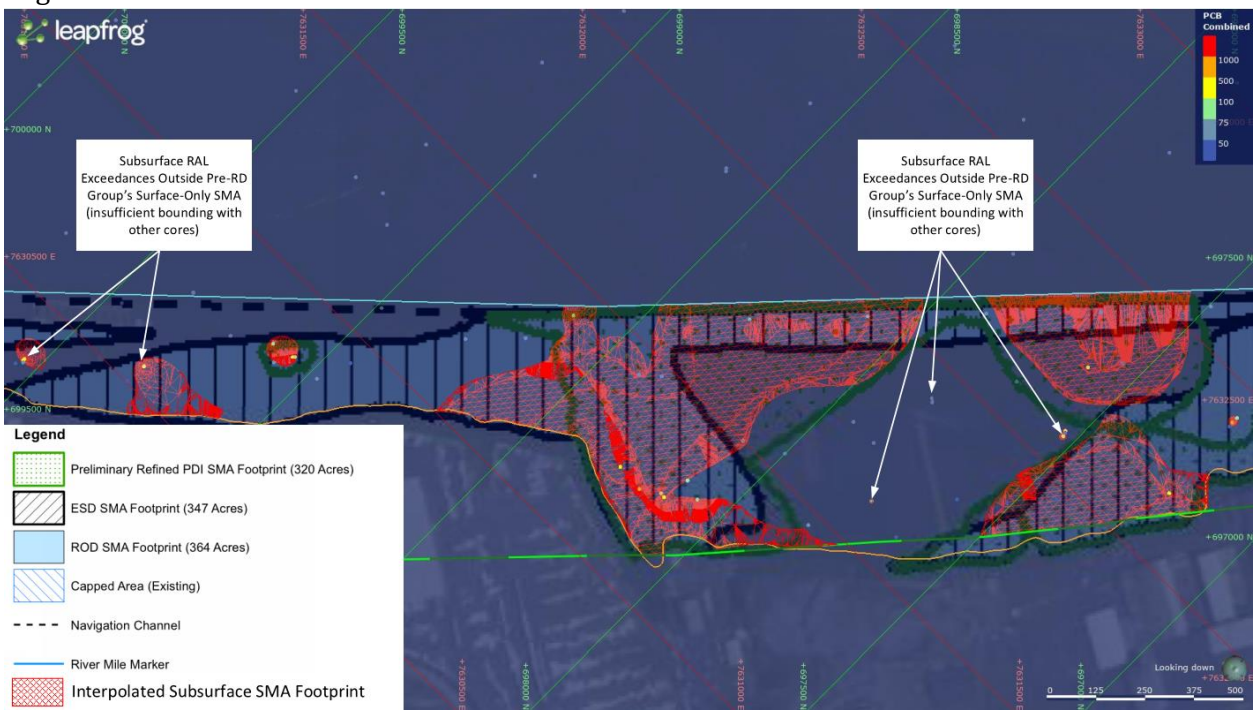

Figure 2. Annotated map showing subsurface sediment RAL exceedances outside of the Pre-RD Group's preliminary refined PDI surface-only SMA footprints. Map shows the area from approximately RM 8W to 8.5W.

Multiple instances of insufficiently bounded subsurface sediment cores with RAL exceedances outside of the Pre-RD Group's SMAs were identified. These areas need to be explored during remedial design and the subsurface modeling is helping to identify where data gaps sampling is needed. The **Supplemental Figures** contain the annotated maps for the rest of the Site broken down by focus areas.

Additionally, the 3-D sediment model was used to identify the presence of PCBs, PAHs, and/or DDx in subsurface sediments in areas of dioxin/furan contamination in surface sediment. This analysis determined that dioxin/furan RAL exceedances in the surface sediments are collocated with the other focused COCs (PCBs, PAHs, and/or DDx) in the subsurface. These findings were summarized in a previous memo (CDM Smith 2019). The **Supplemental Figures** contains the map identifying the areas where surface sediment dioxin/furan RAL exceedances are collocated with the other focused COCs in the subsurface.

Summary and Conclusions

The 3-D sediment model is a useful tool that can be used during remedial design to better understand the areas of contamination, estimate volumes (and therefore cost) of contaminated sediment disposal, and truth-check design plans on smaller spatial scales. The model will be continually updated with new data as they are collected and will evolve and inform throughout the remedial design process.

References

CDM Smith. 2019. *Subsurface Sediment RAL Exceedances in Areas of Dioxin/Furan Surface Contamination*. Prepared for U.S. Environmental Protection Agency Region 10, Seattle, Washington. March 21.

EPA. 2017. *Record of Decision.* Portland Harbor Superfund Site, Portland, Oregon. United States Environmental Protection Agency Region 10, Seattle, Washington. January.

EPA. 2016. *Portland Harbor RI/FS, Feasibility Study.* U.S. Environmental Protection Agency Region 10, Seattle, Washington, June.

GSI Water Solutions, Inc. 2014. *Final Supplemental Remedial Investigation/Feasibility Study Field Sampling and Data Report, River Mile 11 East, Portland, Oregon.* Prepared for RM11E Group. September.

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